Changing the Focus of an Organization: From Information Systems to Process Aware Information Systems

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Abstract. Organizations that manage their Business Processes (BPs) poorly -or that not manage them at all- have well-known problems regarding their operation, both at the BPs and the Information Systems (IS) levels. Some of these problems are due to a vertical and functional vision of the organization, without any global BP vision. In this context, similar decentralized organizational units very often perform the same BPs sometimes in different ways. Moreover, some BPs are implicit in the IS supporting them. In this article we present an experience report of a BPM pilot project we have carried out within our university, as an initiative to improve BPs management and corresponding IS support. We started specifying a process map for management support BPs, and then we selected key BPs which where specified, modeled and implemented using BPMN 2.0 and Bonita BPMS, to shift the organization focus from traditional IS to Process Aware IS (PAIS).

Keywords: Business Process Management (BPM) · Process Aware Information Systems (PAIS) · Business Process Management Systems (BPMS) · BPMN 2.0

1 Introduction

Organizations that manage their Business Processes (BPs) poorly -or that not manage them at all- have well-known problems regarding their operation, both at the BPs and the Information Systems (IS) levels. Some of these problems are due to the size of these organizations, which have many organizational units, some of them decentralized and sometimes with duplicated responsibilities, carrying out the same BP in different units in a different manner and maybe with a different name. BP variants are mostly unknown to the organization, not only regarding the activities each one entitles, but also the conditions or variation points that determine the different variants. Also, the fact that most BPs are implicit in IS, supported by menu options with no sequence defined among them and no explicit conditions defined to perform one or another, make it difficult to identify the control flow of the BPs. In most cases, these organizations rely on people knowledge about BPs or at least regarding the activities of the organizational unit to which they belong (without complete knowledge of the

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BP in the organization). This lack of global vision and explicit knowledge of the BPs throughout the organization prevents it to assess its daily operation, and to identify improvement opportunities, since BP measures and objectives are also missing.

The university of which we are part of, Universidad de la República (Udelar) from Uruguay, suffers from most of these problems, due to characteristics such as its size regarding faculty members and students, its organizational structure and the fact of having organizational units decentralized, among others. Despite having an Management Improvement Group aimed at defining and taking actions to improve management throughout the university, there is no deep knowledge of Business Process Management (BPM) [1,2] nor of technological support such as BPM Systems (BPMS) at the university general level. Although BPM is recognized as a way of working with explicitly defined BPs, there is no knowledge of even simplest definitions such as what a BP is, e.g. they identify common functions such as accounting and human resources management as processes, which are clearly areas composed of many different processes. In terms of an organizational maturity model such as the Business Process Maturity Model (BPMM) [3], the university can be seen as mainly at Level 1: Initial - where BPs are performed in inconsistent and sometimes ad hoc ways, with results that are difficult to predict. Having detecting the many problems that the university has regarding its characteristics and context presented above, and with the main goal of improving managerial efforts, the Management Improvement Group defined several lines of action in 2012, regarding existing human resources, the current organizational structure and the BPs that are carried out within the university.

In this article we present an experience report from a process management improvement project we have carried out as part of these lines of action, regarding the management support BPs carried out within the university. For doing so an interdisciplinary group was created integrating business and software visions and knowledge. The project was recently finished and comprises two years with focus on: firstly the definition of a process map of the university management area to have a global view of their BPs (Phase 1), and secondly a methodological experimentation with an organizational unit in order to identify and specify selected key BPs as well as to show technological options to support them (Phase 2). Both phases were steps for leading to a real adoption of BPM in the university, as part of a more general and longer project which includes the adoption of a methodology for BPM, the evaluation and acquisition of a BPMS, the specification and implementation of all identified BPs and the replication of the experience in other organizational units.

As support methodology we used the Business Process Continuous Improvement Process (BPCIP) [4] which provides a guide for carrying out and integrating improvement efforts in the organization, which was defined within our research group. It extends the traditional BP lifecycle [2] with specific measurement and improvement elements. We selected this methodology since it was proposed within our research group so we were familiar with the disciplines, activities and roles it defines, and as it was already validated in the context of a PhD thesis by means of a case study within a hospital in Spain, which is also an institution which presents the characteristics mentioned above. Main organizational elements we analyze are: (1) although BPCIP was validated within a similar institution, it has never been used before in an educational

institution and this one has no previous knowledge of BPM and its technological support (2) since the authors are part of the university (not external consultors) and were also part of the team which carried out the experience, we worked together with business people providing our own knowledge of the institution, and (3) the institution cultural context is a singular one since it is autonomous (from the government) and co-managed by its teachers, students and alumni.

The rest of this paper is structured as follows. In Section 2 we introduce the business process improvement project and its context, and in Section 3 we present its actual execution. In Section 4 we discuss lessons learned and reflections on the results we have obtained. Finally, in Section 5 we draw some conclusions and future work.

2 The Business Process Improvement Initiative

The Udelar university employs near ten thousands teachers (professors and lecturers) from all academic areas (Social, Medicine, Engineering, Architecture, Chemistry, Arts, etc.), more than six thousands of non-teaching staff, and serves near one hundred thousand students. It is composed of a central unit and near twenty decentralized schools which are grouped into conceptual areas (Health, Science and Technologies, Social and Humanities, etc.). Each school is in turn organized with its own structure regarding academic departments (i.e. Engineering School has institutes such as Computer Science, Electrical Engineering, Civil Engineering, etc.). Each school also has its own management structure composed of many administrative units such as admission office, human resources, accounting, building maintenance, library, etc., some of them coordinated by specific offices at the central unit. Udelar is the only public university of the country and its main educational institution regarding not only grade and postgraduate degrees, but also research. It is autonomous and co-managed by its teachers, students and alumni, a political system which although defended by all interested parties, adds many levels of discussion and delays in making decisions.

As a starting point of the BP improvement initiative, the main concern of this project was the definition of a process architecture [5] with respect to management support BPs. A process architecture is a conceptual model that shows the BPs of the organization and makes their relationships explicit. It has several levels of detail, as depicted in Fig. 1. Level 1 shows the main BPs at a very abstract level whereas Level 2 is composed of a refined version of such BPs, but still in an abstract way. In Level 3 we have a detailed version of those BPs, as for example using the Business Process Modeling Notation (BPMN) [6]. Level 1 presents the most important challenge for the definition of a process architecture since it must be understandable and sufficiently complete to be accepted as a description of the organization. In addition, three different types of BPs can be identified: strategy BPs which are performed by the organizations head to define objectives and plans, key BPs which contributes to the organization's mission regarding the defined objectives, and management support BPs which are those carried out to support the key ones, and subject of this work.

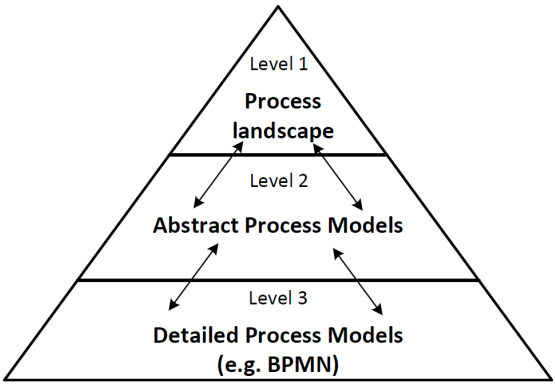

Fig. 1. The different levels of detail in a process architecture [5]

For the definition of such an architecture, we have followed the BPCIP [4] methodology, which provides a guide for carrying out improvement efforts in the organization, as mentioned above. It extends the traditional BP lifecycle [2] with measurement and improvement activities which involves the definition of a BP Execution Measurement Model (BPEMM) [4], a model that integrates execution measures for BPs realized by services in a comprehensive way. BPCIP consists of the same four phases as [2], from modeling a new BP or redesigning an existing one, to the evaluation of its real execution to identify improvement opportunities. We partially addressed the Design&Analysis phase with respect to the Business Modeling (BM) and BP Execution Measurement (EM) disciplines. The BM discipline aims to obtain a map of the organization and its BPs and to gain a better understanding of the business by representing their BPs explicitly as models. Moreover, the EM discipline sets out to show explicitly the execution measurement activities to perform in the extended BP lifecycle of BPCIP. In particular, we addressed the following activities within these disciplines.

- **BM1 - Asses the Organization**. The current state of the organization is described in terms of their current BPs, tools, people skills, customers, competitors, technological challenges, problems and areas of improvement, among others.
- **BM2 - Identify Business Processes**. To understand and describe the BPs in the organization, mainly those related to the application being developed, specifying the BPs models using BPMN 2.0.
- **EM1 - Select Execution Measures**. The execution measures are selected from BPEMM in order to define which data will be registered from the BP execution, to be able to analyze the execution.

2.1 The Design and Analysis Project

The project was divided in two one-year consecutive phases which are described next and detailed in Section 3:

- **Phase 1: Process map**. We mainly developed a process map identifying every management support BPs in the organization and categorizing them in conceptual areas, i.e. abstract categories relating BPs without any direct relation with a section of the organization to avoid ownership by definition. For each BP we also describe a very abstract data sheet including the process owner, participants, objectives, existent software support tools, among other aspects. This phase corresponds to the BPCIP's activity "BM1 - Asses the Organization" and provide us with the Level 1 and Level 2 description of our process architecture. The process map is intended to be a strong communication artifact for supporting the BPM initiative.
- **Phase 2: Specification of BPs**. We focused on a detailed specification of BPs (Level 3 models based on BPCIP's activity "BM2 - Identify Business Processes"). However, since the organization is not currently set for the adoption of BPM, we selected some priority BPs and conducted a pilot project. We included not only the detailed description of BPs but also the definition of execution measures (EM1 - Select Execution Measures) for the continuous improvement of those BPs and the development of functional prototypes as a way of showing existing technological alternatives. We also worked on a methodological guide, based on BPCIP, which allows replicating the pilot experience with other BPs.

2.2 Upcoming projects

There are three other phases projected for the BP improvement initiative:

- **Phase 3: Evaluation of Business Process Management Systems (BPMS)**. We need to evaluate different BPMS solutions fit to the organization. We plan to follow our systematic approach for evaluating BPMS [7]. This approach provides a list of key characteristics of BPMS which are ranked by the organization and evaluated using test cases and quantitative criteria. A mandatory requirement is to establish centralized BPM support and avoid the proliferation of management systems in such distributed organization. In this sense, the evaluation must be conducted together with software professionals from the University Central Informatics Service ((Servicio Central de Informática Universitaria, SeCIU). Although some software systems are locally used in the many divisions, SeCIU provides centralized software infrastructure and support to several management systems. Thus, their participation is a must for making key decisions for the whole Udelar.
- **Phase 4: BPMS acquisition and configuration**. The BPMS identified in Phase 3 as best suited for the organization must be acquired. Moreover, we plan to configure those BPs from Phase 2 and execute them. This will be the first complete application of BPCIP in Udelar which will allow us to adjust the methodology and take it as a basis for future projects.
- **Phase 5: BPCIP iteration**. This is a never ending phase in which concrete projects must be defined for the full application of BPCIP to other conceptual areas of the process map. This project will allow us to spread the BPM vision. Individual projects would be managed by the central group of people in charge of BPM.

3 Sowing the Seeds of BPM

The two-year project we present here comprises the first two phases defined which started in the second quarter of 2013. As mentioned above, it was sponsored by the Management Improvement Group and the main management authority within Udelar (Pro Rector de Gestión Administrativa), as well as other authorities. In addition to our participation providing the BPM methodological and software vision, the project team was also integrated with a researcher from the Faculty of Economics and Business Administration (Facultad de Ciencias Económicas y Administración) providing a purely management vision of BPM and BPs, a software professional from SeCIU providing the technological vision of the university's capacities; and two members from the management team of the main sponsor of the project (Pro Rector de Gestión Administrativa) providing the global vision for the results of the project. In the following we describe the execution of the project from the point of view of each BPCIP activity performed and the corresponding project phase.

3.1 Assessing the Organization

The focus of the first phase was set on defining a process map for the management support BPs of the Udelar, since the sponsor of the project was the management area they wanted to help identifying and organizing the BPs for the management structure. The steps defined in BPCIP to carry out this activity include understanding and specifying several aspects of the organization such as BPs context, technological context and human context, problems and improvement opportunities, and stakeholders for the business modeling effort. To do so, as the first activity of the project we carried out a workshop with administrative directors and organizational units responsible, presenting the general theory of BPM and the initial proposal of the project. Then working in groups of five or six people, we asked them to identify and named as many BPs as they recognize as possible, their responsibles, organizational units involved and the existence or not of software support. The result of this activity was a first coarse-grained identification of conceptual areas and their main mangement support BPs, which we wrap up together with the working groups.

To further detail and identify BPs with a finer granularity, we conducted several two hour interviews with the workshop participants at they workplaces, digging into the work each organizational unit performs within each defined BP, and identifying new ones. For doing so, we divided the project group into two interviewers groups, scheduling two interviews by week (one by each group on Tuesdays and Wednesdays) and putting together the results in a general meeting of the project group on Thursdays, where we analyzed and discussed the advances. Although the interviews were planned to be conducted within two months, they were actually carried out within the period July to October 2013, mainly due to difficulties in scheduling them with the required participants. As the main product of this activity and of Phase 1 of the project, a process map for the management support BPs of the university was generated, validated with the participants and the sponsors, and diffused within the organization, including a presentation in an internal management working day.

As mentioned before, the structure of the process map was defined in two levels: a first level in which we defined conceptual areas such as human resources, planning and accounting, student's admission and registry, identifying the management support BPs in each one, and a second level in which we assigned each BP from each conceptual area to an organizational unit. We also identified two points of view for the execution of the management support BPs: centralized within the central unit of the university and the central offices, which coordinates with organizational units within each faculty, and decentralized within each faculty, which are executed solely or mainly within each faculty without centralized intervention. We did not detail these BPs as the main focus of the project was the ones including centralized stakeholders. Fig. 2 presents an example of the process map and the two defined levels, where the conceptual areas are identified by different colors and numbering, with decentralized (e.g. those from each Library) and centralized BPs (e.g. those from SeCIU).

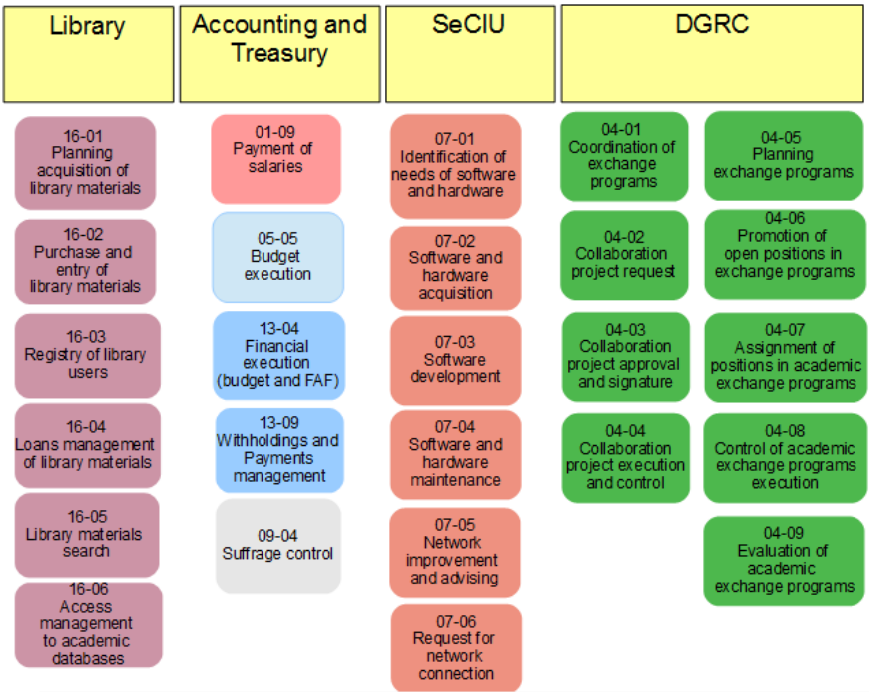

Fig. 2. Process map example with centralized and decentralized BPs

For each BP defined in the process map we also generated an identification data sheet with a high level description of the BP, its objective and owner, its participants in three levels: initiator, intermediate and final, the main artifacts it manages and the existence of support software. Fig. 3 shows the data sheet for the "Assignment of positions in academic exchange programs" BP.

Process Name:	Assignment of positions in academic exchange programs
Objectives:	To assign the available positions in academic exchange programs for students
Participants:	Student, Faculty, Dirección General de Relaciones y Cooperación (DGRC), Comisión de Relaciones Internacionales y Cooperación Regional e Internacional (CRI y CRI)
Owner:	Dirección General de Relaciones y Cooperación (DGRC)
Description:	It includes the reception the application forms for academic exchange programs from students, the evaluation of those students and the final assignment of avilable positions.
Software:	No

Inputs		
Items	Initiator	Comments
Application forms	Student	Open positions are defined by foreign universities
Intermediate Products		
Items	Participant	Comments
Preliminary priority list	Faculty, DGRC, CRI y CRI	Each Faculty analyzes their correspondent application forms
Outputs		
Items	Receiver	Comments
Assignment list	Student, CRI, CRI	

Fig. 3. BP data sheet for the "Assignment of positions in academic exchange programs" BP

3.2 Identifying BPs

The focus of Phase 2 was to detail a set of priority BPs to generate an initial specification including a detailed description and a model in BPMN 2.0. We chose this notation for many reasons: firstly it provides several elements and constructions to support most modeling situations including workflow patterns [8], secondly in last years it has gained acceptance in the business, academic and industrial world, and it is well understood by business people; and finally since we believe the model we specify with business people should be the basis for the software development, it should be changed minimally to be able to execute it as it should be also the one business people see when executing the model in a BPMS process engine such as Activiti or Bonita.

To select the BPs to work with, we first detailed the criteria we had drafted in Phase 1, trying to balance several aspects that we found interesting to try in this first experience in the university. We did not want to select BPs that will not be representative of the type or size of the management support BPs the university deals with. Based on this objective we defined the following criteria:

- Users: BPs should cover the largest number of identified participants, i.e. teachers, staff, students, other institutions, among others. This will cover most types of requirements that each type of user has when interacting with the university.
- Impact: BPs should navigate between many organizational units. This will cover different types of internal interactions that occurs inside the university to perform the BPs, highlighting communication issues that should be addressed.
- IS support: BPs should not have or have minimal software support to be performed since many IS were developed with a vertical vision focused on the organizational unit requirements and will limit the global vision of BPs.
- Definition: BPs should have been identified in the first phase of the project, and they should be well defined although they are not specified or modeled. The organizational unit responsible for the BPs should be able to detail them.
- Number of BP instances: BPs should have a high number of instances. This represents how much the BP is performed within the organization and it is desirable to deal with BPs demanding everyday work.

Based on the defined criteria and the process map we have identified, we selected a total of six BPs corresponding to the central unit General Direction of Cooperation and International Relations (Dirección General de Cooperación y Relaciones Internacionales, DGRC), regarding academic exchange programs for graduate and postgraduate students and teachers, and collaboration projects between the university and external institutions (national and international). They meet the criteria we have defined since they involve several types of users (students, faculty, and staff) and they impact in many organizational units with internal and external interaction going from different university schools to external institutions and internal administrative units. The responsible unit is centralized and BPs definition is adequate (there is documentation and previous experiences that allow a good approximation). Furthermore, they can be extended to specific schools on a future testing phase, which makes the volume of instances manageable. The selected BPs are as follows:

- Academic exchange programs
  - 04-07 Assignment of positions in academic exchange programs
  - 04-08 Control of academic exchange programs execution
  - 04-09 Evaluation of academic exchange programs
- Collaboration projects
  - 04-02 Collaboration project request
  - 04-03 Collaboration project approval and signature
  - 04-04 Collaboration project execution and control

An advantage of working with this counterpart was that they were really excited about participating in the Phase 2 of the project and to try and model their own BPs. We agreed on a weekly schedule of work, with meetings with the DGRC staff on Tuesdays afternoon at their workplace, and general meetings of the project group on Thursdays to analyze and process the data. We worked within the period August to December 2014 in the selection, specification and modeling of the selected BPs.

We started with the "Assignment of positions in academic exchange programs" BP, in which for every exchange program in which the university participates (Erasmus, Santander, Fulbright, etc.), positions are announced and interested people (students, faculty, staff) apply for them. The DGRC and other authorities analyzed applicant's merits and after some steps and meetings define the assignments, which are then notified to the applicants. Following the BPCIP steps of the Identify BPs activity, we started with the identification of participants and actors involved, generating a table with each exchange program in the rows side and each participant in the column side, and marking each corresponding cell whenever a participant is involved in an exchange program. We defined participant names as general roles e.g. Evaluator, External Counterpart, etc. and assigned the actual organizations to them based on what they do within each exchange program.Then we carried out the following steps as defined by BPCIP: identify activities to be performed andthe sequence of activities realization, identify decision nodes in the flow, message interaction with other participants (if any), and business rules. It is worth mentioning that when modeling the BP we take into account the workflow patterns [8] and best modeling practices in [9] such as to use verbs to name activities so instead of having "Candidates evaluation" we use

"Evaluate candidates". In Fig. 4 we present the complete model of the "Assignment of positions in academic exchange programs" BP, specified in BPMN 2.0 and with all possible participants and defined interactions.

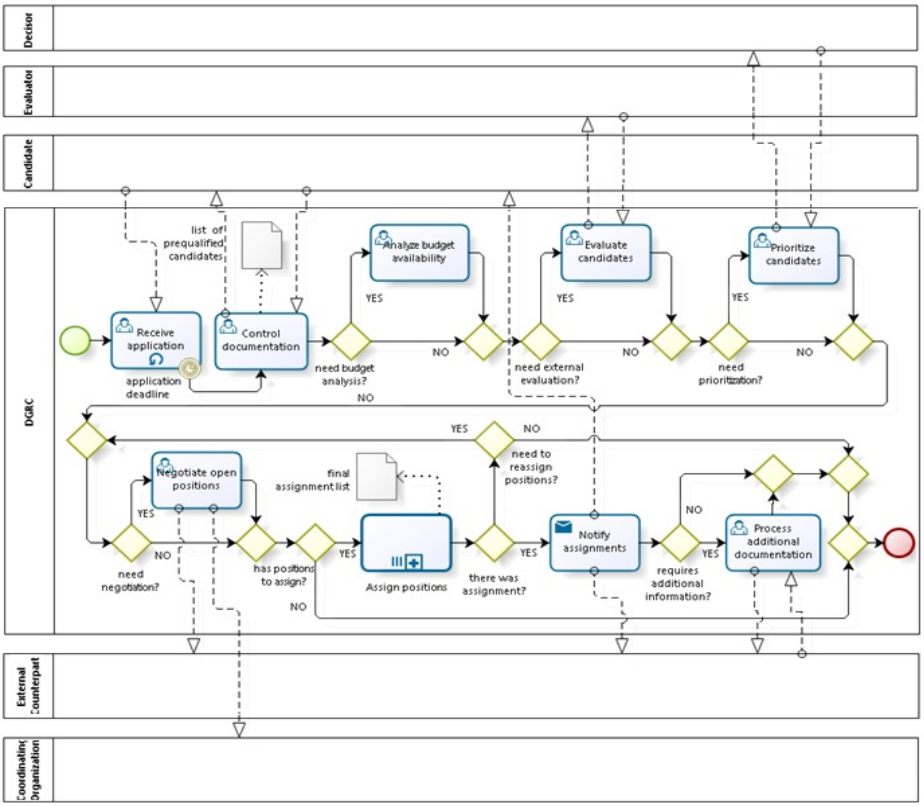

Fig. 4. "Assignment of positions in academic exchange programs" BP model

The first problem we found for specifying the BP control flow was that they visualized one BP for each program, since different people were in charge of different programs and they believed they performed different activities as program requirements are different. We, on the other hand,clearly identified a BP variants problem were all programs share a common set of activities, and based on specific conditions of each program (variation points) different paths are executed, probably involving different participants [10-12]. Although there are many ways to approach the variation modeling of a BP, we selected the definition of blocks based on XOR gateways that will be executed or not depending on the programs settings. We selected this option since it was the easiest way we find to immediately solve the problem at hand and also to provide a simpler way for business people to understand the modeling of all exchange programs within a unique model. To do so for each program we present the corresponding variant with its execution path colored so they can visualize for each program which is the corresponding control flow.

In Fig. 5 we show and example of the model for the Erasmus Mundus program, only with the DGRC pool since it is where the variability is defined depending on the exchange program. It can be seen that when executing the Erasmus Mundus exchange program, the activities that are not colored will not be executed since the condition will be set on "NO" in the configuration of the exchange program. We did the same for the rest of the selected BP so we also provide a unique model for collaboration projects with variants regarding the type of collaboration e.g. national or international, central or decentralized, among other conditions.

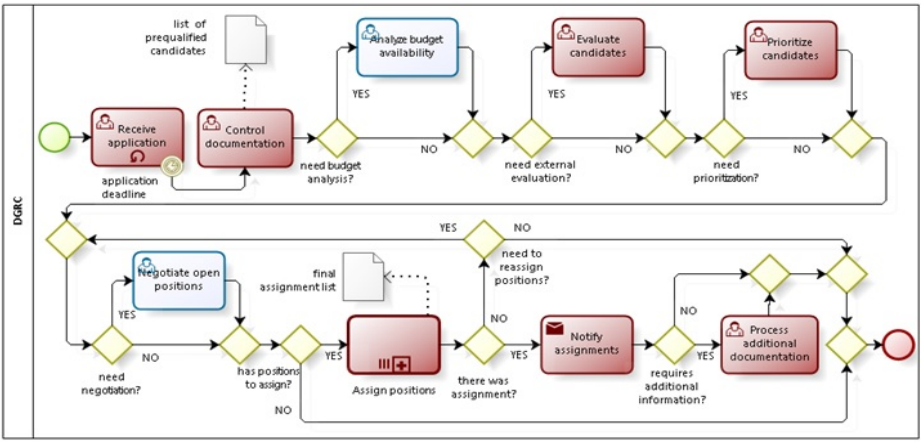

Fig. 5. Variant for the Erasmus Mundus exchange program with colored path

At the same time that we were modeling the selected BPs, we defined a set of requirements for the implementation of a prototype using Bonita BPMS. We developed the prototype as a way of showing to business and IT people how technology supports BPM, how BPs execution is addressed in practice, and how a BPMS integrates many existing technologies for supporting daily operations. We decided to use Bonita since it provide aid for a rapid development and deployment of a BP and we used it (along with Activiti) in graduate and postgraduate courses regarding BPM we teach at the university. We defined to develop two versions of the prototype for the "Assignment of positions in academic exchange programs" BP: the first with a functional focus and the second with technological focus. For the first prototype the requirements were to use as BD postgreSQL (with separated schemas for the BPMS and the organization), Tomcat as web server and JSF for the web front end to interact with the BP from outside the organization (i.e. without having a user and password to execute the intranet web portal), and specific tables for setting and loading the configuration of each exchange program for the execution of corresponding defined variants. In this tables we record for each XOR condition defining a selection block for a variant, whether a program executes it or not. In Table 1 we show how the data for the XOR blocks and exchange programs is registered. When executing the BP, the first selection the user makes is the exchange program, and based on that process variable, the variables of each XOR condition are set from the data in the DB.

Table 1. Example of configuration of XOR blocks for exchange program for the Fig.5 variant

Program Id	XOR1	XOR2	XOR3	XOR4	XOR5	XOR6	XOR7
Erasmus M.	NO	YES	YES	NO	YES	YES	YES

For the second prototype the requirements were to integrate to Bonita the following technologies: Alfresco as a document management system, Apache LDAP as an authentication system for the BPMS users, a Web Services invocation to check with the students admission and registry system whether the student is active and able to apply in an exchange program, and a mail server to send notifications to all applicants.

3.3 Select Execution Measures

As defined by BPCIP this activity is executed in the Analysis&Design phase to determine which execution measures will be calculated when the BP is executed. BPCIP also provides the BPEMM execution measurement model to aid the selection of key measures for BPs from the ones integrated in the model. We presented them with the execution measures defined in BPEMM [4] and helped to select a few to start, since we believe is better to start with a few measures that can be managed and analyzed when the organization have no measures at all. The selected measures included the throughput time of the BP (regarding activities, BP cases and average times for the BP), capacity of the BP (regarding defined resources), cost of the BP, and specific KPI defined with them for the exchange programs within a period, as follows:

- number of exchange programs executed
- number of applications received for all exchanged programs and for each program, and for each type of applicant (student, faculty, staff)
- number of positions granted for all exchange programs and for each program
- number of applications received and positions granted for each university school
- number of origin and target universities and associated countries for all programs and for each program

4 Lessons Learned and Reflection

From an organizational and cultural perspective, we found that a key driver for the success or failure of BPM in an organization is to establish a culture that supports the enactment of efficient and effective BPs. In this project we did not focused on cultural aspects, but on the practical application of some BPM activities in order to promote BPM within the organization. However, we think that the results of the whole BPM initiative can be improved by assessing with some accuracy the cultural level of our organization with respect to BPM, e.g. using some tool like [13]. We know that we are working in a very immature organization. Nevertheless, more information about the sources of immaturity could help to define concrete strategies for improving our organizational context in parallel to the other phases of the initiative. An indicator of a growing culture is the definition of a BPM group formally established within the organizational structure that is responsible for any BPM initiative giving support to all

organizational units with a unified methodological approach. This group must be composed of both management and software engineering professionals. Similarly, BPs themselves need a stable organizational structure where participants and especially process owners are well identified. In this project we did not found an updated and formally approved functional organization chart. This entails several disadvantages that prevents the BPM group establishment as well as may hinder process management when there are no clear formal relationships among participants.

We also claim that the process map is a strong communication artifact for supporting the BPM initiative. In our experience, we request its approval from the highest authorities. This process had some opponents to the extent that one of the organizational units defined without notice another process map focused on their BPs. However, this result has the same vertical view of the organization as ever, forgetting about other organizational units. We found some causes for this opposition. Some organizational units felt not adequately covered either because our methodology was insufficient when extracting information, or there was no careful review from their own side. Moreover, not everyone understood the process map as an evolving artifact which must be reviewed and improved in specific projects such as the one of Phase 2. Even with this opposition, the process map promoted interesting discussions and led to many units to rethink their roles, which is another mandatory step for setting a BPM culture. In other projects we found two different kinds of opposition: to the results and to the people. The one we described before was to the resulting process map. In fact, it was not focused on the process map itself, whose content was praised by everyone, but on the formal approval of the process map, i.e. its content is useful but not as comfortable in the eyes of the whole organization. With respect to opposition to our participation in the project, we found that our belonging to the univeristy generates two different reactions. On the one hand we found that people is more open to share experiences with the team and trust in the activities we propose, especially when there is no want-to-sell-something behavior. On the other hand we found that there is some resistance from managers, mistakenly seeing endanger their roles by the project.

From a conceptual perspective, since the knowledge of BPM and BPs in the organization was minimal, we had to explain several concepts and the vision we had taken to develop the project. A hard concept to transmit was about the arranging of the process map into several conceptual areas which are then assigned to the organizational units responsible for their execution, but which are not necessarily in a one-to-one relation. The global vision beyond the work that is performed within each organizational unit was very difficult to understand, in particular with cross cutting BPs in many organizational units. Another problem related to this was the granularity of the BPs identified. We tried to balance it so each BP identified is at the same level of abstraction, but sometimes this was difficult since the stakeholders did not know the complete detailed BP or confused the part in which they participated with all the BP. The process map shows some disparity in existing BPs. Many BPs are chained and therefore its definition was given in terms of the four typical phases of an administrative BP: detection of needs, planning, execution and control. In some cases it was found that this chain lacks some parts, particularly those related to detection of needs and control. Furthermore, we observed that in some cases the BPs are owned by a

centralized unit that coordinates whereas others are distributed and enacted differently in many units (mainly in decentralized schools). We think that a uniform view of BPs in those four phases helps in detecting potential flaws. In the long-term a periodical revision of the process map must be led by the BPM group using the BPCIP-based methodology we developed, working together with BPs owners and main participants.

Also, in each reunion we found ourselves continually repeating that BPM is much more than modeling BPs or installing a BPMS to execute them, BPM is to provide an organic support to the entire BPs life cycle and to justify both business and technical decisions, using analytical results of their enactment. In this way, beyond that we did not focused on cultural aspects, we believe that short projects let build that culture when main business and technical stakeholders are involved from the beginning, and projects also include BPM skills training activities useful for the development of such project. As an example of this, in Phase 2 we found that a minimum training in BPMN 2.0, as well as the discussion about variability, changed the way the organizational unit sees its BPs. Regarding measures about BPs, we detected that the DGRC lacks some basic information for a detailed report of its daily work, e.g. the return date of the exchange students. The early selection of BP measures as proposed by BPCIP and the execution measures provided by BPEMM generated much interest, helping to define new KPIs to measure specific BPs aspects.

From a technological perspective, we are convinced that it is necessary to address platform-independent initiatives in order to perceive BPM as a wider paradigm and avoid bias in the acquisition of a BPMS. However, since it is desirable to support BPs life-cycle using a BPMS instead of many adhoc software systems, it was necessary to balance people's expectations, pointing out the future value of the activities we were doing with a prototype of the final system. Although we consider that this action was useful in terms of BPM cultural growing, it naturally built the expectation of having a functional running system in the short term. Once again, without a BPM group and a centralized BPMS this false expectation can be dangerous in terms of the interest of people for developing partial BPM projects as the one in Phase 2.

Finally, from a methodological perspective, we confirmed that it is very important to guide the BPM effort with a systematic approach to identify and specify PBs, and that the BPCIP methodology provided a useful template that can be adapted to specific aspects of the organization, in particular with respect to the people involved in a project and the interaction mechanisms the project needs.

5 Conclusions and Future Work

We have presented an experience report corresponding to a BPM improvement initiative we are carrying out within Udelar. This two-year project involved the definition of a process map with respect to mangement support BPs and a pilot phase of BP modeling and prototyping. The project was carried out by an interdisciplinary group of both business and technical stakeholders. Although the organization has a very immature level with respect to BPM, we found much interest in the ideas we have proposed and an interesting engagement of stakeholders. Some ideas were very hard

to transmit and the results were not easily accepted by everyone. However, the project led to very interesting discussions. In fact, the management authorities perceived the value of this project and support its continuation. Beyond the refered value for the organization, we identify open research fields with respect to BP variability and we expect that in the short-term this ongoing work could feed back this initiative.

The BPCIP methodology was a useful guide and helped us to carry out the work in a systematic way. The use of BPMN 2.0 promotes the participation of non-technical stakeholders, as well as the discussion around execution measures, and the development of a prototype builds a long-term vision. Nevertheless, we need to continue with the upcoming projects in order to strengthen our conclusions.

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